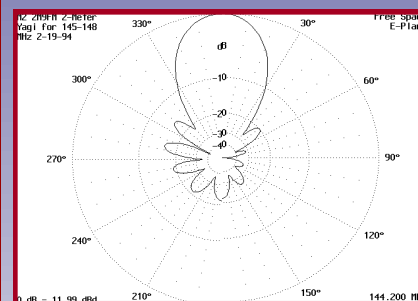
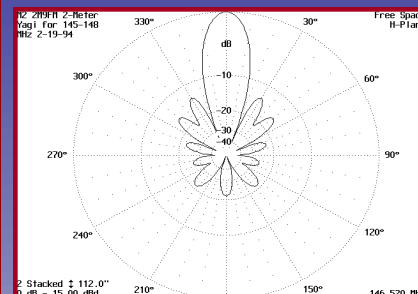
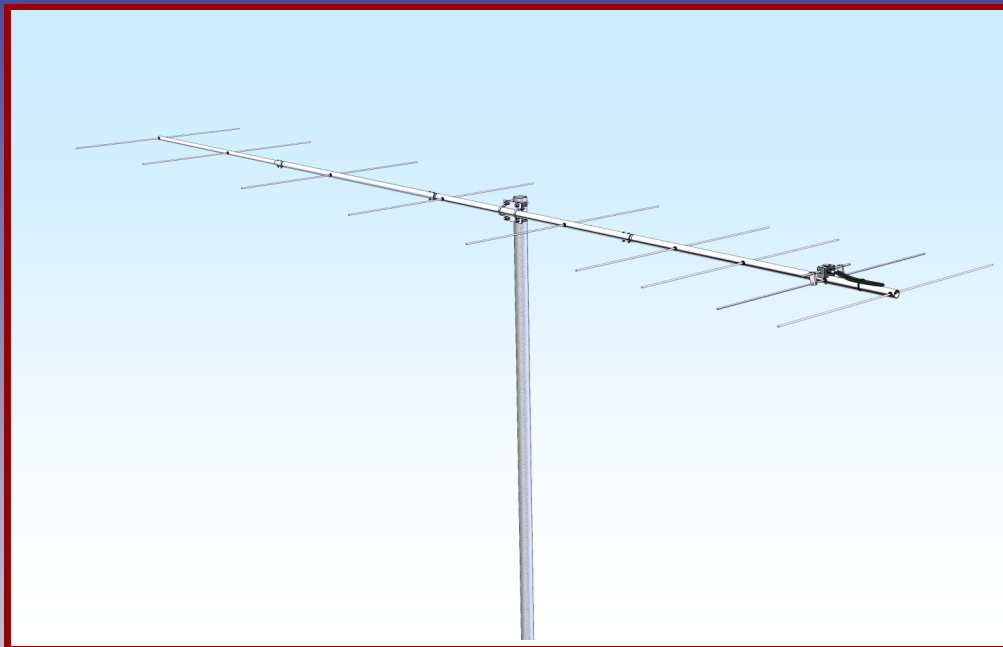




# M2 Antenna Systems, Inc.

## Model No: 2M9X



### SPECIFICATIONS:

Model .....2M9X  
 Frequency Range (2M9X SSB) .144 To 146 MHz  
 Frequency Range (2M9X FM)....145 To 148 MHz  
 \*Gain .....14.1 dBi  
 Front to back .....20 dB Typical  
 Beamwidth .....E=35° H=38°  
 Feed type .....“T” Match  
 Feed Impedance. ....50 Ohms Unbalanced  
 Maximum VSWR.....1.2:1 Typical

Input Connector .....“N” Female  
 Power Handling .....1.5 kW  
 Boom Length / Dia.....14’ 6” / 1” To 3/4”  
 Maximum Element Length.....40-5/8”  
 Turning Radius: .....8’  
 Stacking Distance.....9’ 6” High & 10’ Wide  
 Mast Size.....1-1/2” to 2” Nom.  
 Wind area / Survival .....1.2 Sq. Ft. / 100MPH  
 Weight / Ship Wt.....5 Lbs. / 7 Lbs.

**\*Subtract 2.14 from dBi for dBd**

### FEATURES:

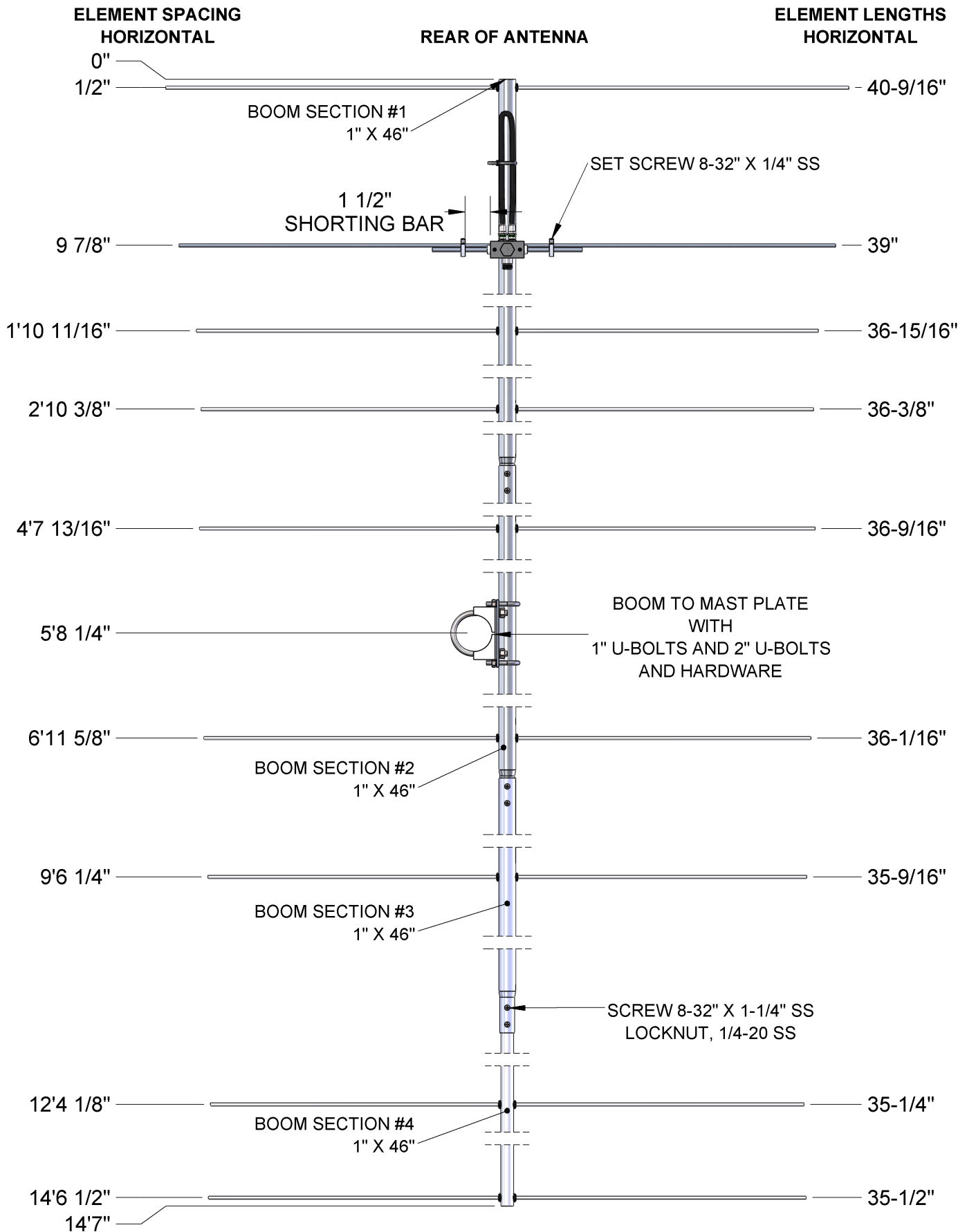
M2 is always trying to design and build new antennas to fit the needs of amateur radio operators. The “X” series of antennas are all designed to keep the packaging under 48” long to minimize oversize surcharges applied by shippers. The “X” series antennas offer the same performance as its predecessor, but with shorter boom sections. The boom sections also have a thicker wall for added strength. A side benefit of the “X” series antennas are that they are more portable with the smaller sections. The 2M9X replaces our very popular 2M9SSB/FM.

Each models performance is optimized for a specific mode and frequency range, with no compromises to achieve unneeded bandwidth. The 2M9X SSB covers 144-146 MHz and the 2M9X FM covers 145-148 MHz. Where do you want to make yourself heard? Both models are ideal building blocks for a small turning radius, high-gain stacked array. Two horizontally polarized, vertically stacked 2M9X’s yield the same gain (14.8 dBd) as M<sup>2</sup>’s 33 ft 2M5WL, but with about 1/2 the turning radius. Great for QTH’s that won’t permit a long boom Yagi. The 2M9X can be stacked on a cross boom for the same gain increases, and the turning radius is still a very manageable 10 ft.

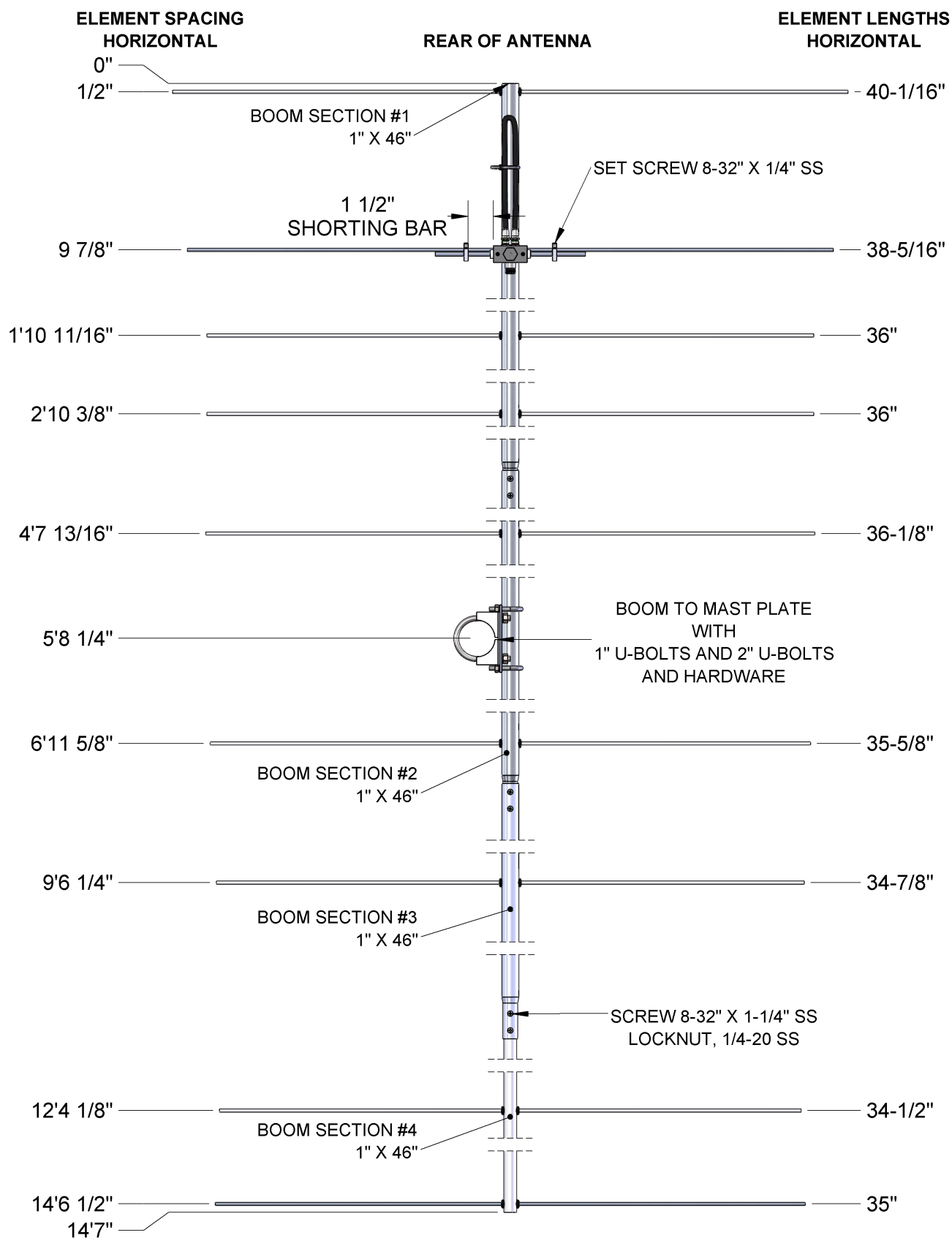
The heart of these antennas is a driven element module originally designed for maritime ATS satellite service. All connectors are O-ring sealed to the CNC machined block. Internal connections are sealed with a space-age silicone gel with nearly 4 times the dielectric strength of air. The balun connectors are triple sealed on the coax and nut-sealed at the block connectors. The type “N” feed connector uses a gold-plated, beryllium copper center pin.

Elements are 6061-T6 3/16” solid rod with UV stabilized polyethylene Button insulators and stainless steel keepers. Thousands of these type elements are in amateur and commercial service with NO failures! Booms are constructed of 6061-T6 aluminum alloy tubing. Other key electrical and mechanical components are CNC machined for accuracy and durability. All hardware is stainless steel except the U-bolts. For uncompromising performance and long term electrical / mechanical integrity, the 2M9X is unmatched.

# 2M9X SSB DIMENSION SHEET

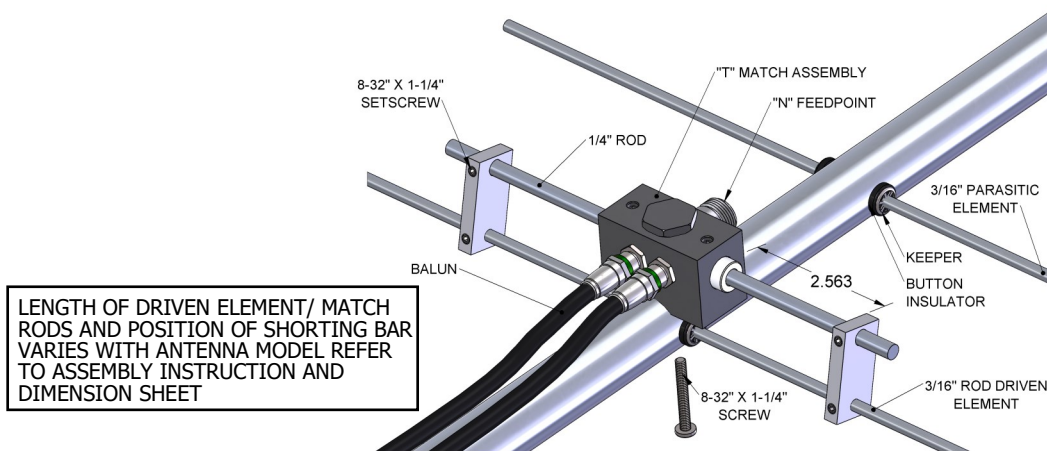


# 2M9X FM DIMENSION SHEET



# 2M9X ASSEMBLY MANUAL

1. Start by laying out the boom sections using the DIMENSION sheet as a guide. Use 8-32 X 1-1/4 screws and locknuts to join sections. Sections may be swaged to fit each other or use short internal splice sections.
2. Lay out the elements by length and position as shown the DIMENSION sheet. Start with the reflector (longest) element and push on a black button insulator to about 1/2" from center. Push the element through the holes 1/2" from the rear of the boom and install the second button, snugging it up into boom. DO NOT BOTHER WITH ACCURATELY CENTERING the element at this time and DO NOT INSTALL the stainless steel SHAFT RETAINERS yet. This is easier to do after all the elements are installed in the boom.
3. Install the 3/16" rod DRIVEN ELEMENT as you did the reflector. Then continue with the installation of the DIRECTORS. **Note that the Director Elements do not consistently diminish in length from rear to front, so pay close attention to length and position.**
4. Now begin centering the elements. Use a tape measure to EQUALIZE the amount the element sticking out on each side of the boom. Once you have all the elements centered, sight down the element tips from the rear comparing each side. Look for any obvious discrepancies and correct if found.



5. NOTE: The SHAFT RETAINERS, used for securing the elements, should always be used for permanent and long term antenna installations. For portable or temporary use, or whenever it is anticipated that the antenna will be disassembled within a short time, the retainers may be left off. The button insulators, normally a tight fit, hold the elements quite securely. Begin installing the stainless shaft retainers. Use thumb and index finger to hold a Shaft Retainer over end of the 3/8 x 3" push tube (Shaft Retainer dished into tube). Hold the element firmly and start the keeper onto the rod by applying pressure with the push tube. Push the Shaft Retainer until up tight against the button insulator (Locking pliers, **lightly** clamped up against opposite button insulator will help maintain center reference and keep you from pushing the first Shaft Retainer too far). It is a good idea to install the second SHAFT RETAINER after final testing.
6. Mount the DRIVEN ELEMENT T-MATCH BLOCK to the underside of the boom using a single 8-32 X 1-1/4" screw. Orient the block with feed connector facing to center and balun connectors facing to rear. Block orientation may be reversed if you wish feedline to exit from rear of boom.
7. Coil the balun so it will not extend beyond the reflector when installed. Attach balun to the block and tighten the connectors **gently** using a 7/16" end wrench. A lot of torque is unnecessary. Squeeze the balun coil across the middle until it is close to the boom and secure to boom with a nylon cable tie. Tie should be snug but not crushing or kinking the coax.
8. Install the 8-32 x 1/4" set screws (internal Allen head - tool supplied) into the SHORTING BARS.

# 2M9X ASSEMBLY MANUAL

Slide the bars onto the 3/16" rod driven element tips and then onto the Driven Element Block Rods. Position the Shorting Bars as specified on the DIMENSION SHEET: the distance given is between the outer edge of the Driven Element Block and the inner edge of the Shorting Bar. Align the bars and rods with each other and tighten the set screws.

9. The boom to mast plate is normally mounted at the balance point, about 70" from rear of boom. Use two 1" U-bolts and the stainless nuts and lock washers provided. **DO NOT OVER TIGHTEN.** 2" U-bolts and cradles are provided for mounting the antenna, other sizes are available for purchase. Since the feed line represents significant weight it is best to have it attached and fastened along the boom with cable ties before final mounting the plate.

## 10. INSTALLATION AND TESTING STACKING INFORMATION

**A.** To protect your investment in this high performance antenna, always use high quality coax and connectors. Old, corroded, or poor quality materials are common sources of serious performance losses.

**B.** Test the antenna, connectors and feedline, **BEFORE** installing to your mast or tower. At 6 feet or more the antenna will exhibit VSWR *similar* to higher mounting heights. Set antenna on a ladder or temporary mast. Check for continuity and match across the band. It should be close to "spec" across the rated bandwidth. When satisfied, add the second SHAFT RETAINERS as described in step 5.

### **C. STACKING REMINDERS:**

1. All driven element blocks **MUST** be oriented to the same side of boom.
2. All boom-to-mast plates **MUST** be mounted at the same point on the boom.
3. Feed / phasing lines **MUST** be of equal electrical length or multiples of 1/2 wavelength in order to maintain equal phasing in the array. Improper phasing can severely deteriorate performance.
4. As a general rule, you never want to have metallic structures, such as a mast or feed lines parallel to the elements unless it is behind the reflector. Having a metallic structure in the same plane as the elements in front of the reflector element can cause VSWR problems and or skewed patterns.

**FOR HORIZONTAL POLARIZATION**, the antenna may be mounted to a **METALLIC** vertical mast or a horizontal **NON-METALLIC** cross boom. If mounted to a horizontal cross boom, route the feedline forward to the boom-to-mast plate, loop down, and bring back to cross boom at least 6" beyond element tips. Antennas are typically stacked one above the other in horizontal polarity. **SEE SPEC SHEET FOR STACKING DISTANCE.** See Stacking Reminders.

**FOR VERTICAL POLARIZATION**, the antenna may be mounted to a **NON METALLIC VERTICAL MAST** or a horizontal **METALLIC** cross boom. If mounted to a **NON METALLIC** vertical mast, Turn the driven element 180 degrees so the feed line and "N" connector is facing to the rear of the antenna. Route the feed line to the rear of the antenna, keeping 4" to 6" behind the reflector element. Let the cable droop at least 6 inches **BELOW THE VERTICAL ELEMENT TIPS**. Re-attach the feed line to the mast below the element tips. A simple structure can easily be fabricated if you want something to support the feed line. See M2 "L" brace kit for ideas. Vertically polarized Antennas are typically stacked side by side on a horizontal cross boom. See Stacking Reminders.

If you are unsure about stacking multiple antennas, please call **M<sup>2</sup>** and let us help you **DO IT RIGHT!** Visit our website, <https://www.m2inc.com/blog/> for other tips.

# 2M9X PARTS & HARDWARE

DESCRIPTION	QTY
BOOM SECTION, 1 X .065 X 45" SOE (M2ABS2M9X-1) .....	1
BOOM SECTION, 1 X .065 X 45" SOE (M2ABS2M9X-2) .....	1
BOOM SECTION, 1 X .065 X 45" SOE (M2ABS2M9X-3) .....	1
BOOM SECTION, 3/4 X .065 X 46" SOE (M2ABS2M9X-4) .....	1
ELEMENTS, 3/16 ROD X 2M9X SSB Dimension Sheet .....	9
ELEMENTS, 3/16 ROD X 2M9X FM Dimension Sheet .....	9
DRIVEN ELEMENT ASSEMBLY (SADEA2MVHF1) .....	1
BALUN, RG-6 1/2 WAVE (SABAL2M144).....	1
BOOM-TO-MAST PLATE, 0.125 X 3" X 4" .....	1
U-BOLT AND CRADLE, 2" .....	2
U-BOLT, 1" .....	2
ASSEMBLY MANUAL .....	1

## IN HARDWARE BAG:

SHORTING BAR (M2ASB0090).....	2
BUTTON INSULATORS .....	18
SHAFT RETAINER, SS .....	18
NUT, 5/16-18 SS .....	4
LOCKWASHER, 5/16 SS .....	4
NUT, 1/4-20 HEX.....	4
LOCKWASHERS, 1/4 SS .....	4
SETSCREW, 8-32 X 1/4 SS .....	4
SCREW, 8-32 X 1-1/4 SS .....	7
LOCKNUT, 8-32 SS.....	6
CABLE TIE, 7" NYLON.....	3
ALLEN HEAD WRENCH, 5/64" .....	1
PUSH TUBE, 3/8" X 3" .....	1

## M<sup>2</sup> ANTENNA SYSTEMS, INC.

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